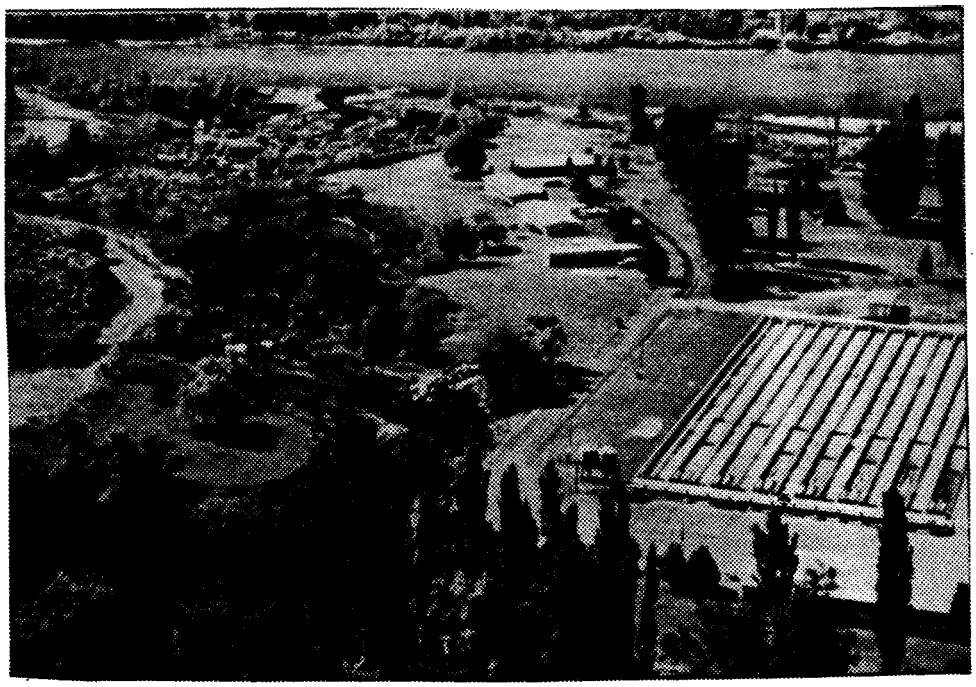
NIAGARA SPRINGS STEELHEAD HATCHERY

1992 Steelhead Brood Year Report



by

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September 1994
IDFG 94-26

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ABSTRACT

Niagara Springs Hatchery received 1,131,951 eyed eggs (Salmon River stock) from Pahsimeroi Hatchery and 1,013,846 eyed eggs (Snake River stock) from Oxbow Hatchery, for a total of 2,145,797 eggs. Egg shipments were received March 30 through May 22, 1992.

A total of 373,000 fry and fingerlings were shipped from Hagerman National Fish Hatchery to Lynn Babbington (a private fish rearing contractor) for final rearing to the smolt stage. In addition, 402,383 fingerlings were shipped from Hagerman National Fish Hatchery to Babbington's.

Babbington-reared fish were planted in Hells Canyon (576,556 fish at 4.40 fish/lb, or 131,090 lbs), in the Little Salmon River (222,560 fish at 4.36 fish/lb, or 51,000 lbs). In addition, 306,907 steelhead smolts at 4.48 fish/lb, or 68,500 lbs, were utilized as catchable rainbow into Brownlee Reservoir.

Spring smolt releases from Niagara Springs Hatchery totalled 1,115,400 fish, weighing 235,075 pounds, averaged 4.74 fish per pound. Spring smolt releases included 761,800 smolts (162,825 pounds) into the Pahsimeroi River and 353,600 smolts (72,250 pounds) into the Snake River at Hells Canyon Dam.

Feed conversion rate during production was 1.41:1 and was attained by feeding 314,136 pounds of Rangen's feed and 17,530 pounds of Bioproducts feed. Total weight gain for the year was 235,075 pounds at a feed cost of $115,553.21.

Experimentation with high density rearing versus low density rearing was used in nine raceways (three control raceways) as part of a three-year study to determine what role density has on fish health, fish quality, downstream migration, and adult returns.

INTRODUCTION

Niagara Springs Hatchery, owned and financed by Idaho Power Company (IPC) and operated and staffed by the Idaho Department of Fish and Game (IDFG), is located in the mid-Snake River Canyon, ten miles south of Wendell, Idaho. Niagara Springs is one of four hatcheries IPC owns and IDFG staffs and operates that fulfills IPC's mitigation requirement under the Federal Energy Regulatory Commission (FERC) license. The goal of Niagara Springs Hatchery is to rear 400,000 pounds of steelhead trout Oncorhvnchus mykiss smolts. Originally, these smolts were used to relocate a portion of the Snake River steelhead run into the Salmon River. Now, 200,000 pounds of production is used to enhance the steelhead run in the Snake River below Hells Canyon Dam, and 200,000 pounds are planted in the Salmon River.

OBJECTIVES

The two major mitigation requirements that must be met at IPC': Niagara Springs Hatchery are to produce quality steelhead smolts to supplement the steelhead trout runs in the Snake River below Hells Canyon Dam and in the upper Salmon River and its tributaries. By meeting these objectives, the project goals will be realized.

1. To rear 200,000 pounds of quality steelhead smolts to be released in the Salmon River and its tributaries. These are to return as adults to the Salmon River in sufficient numbers to provide a quality sports fishery and supply brood stock (1,000 adults) to the Pahsimeroi Hatchery for collection of spawn for the next production cycle.

2. To rear 200,000 pounds of quality steelhead smolts to be released in the Snake River below Hells Canyon Dam. These are to return as adults to the Snake River in sufficient numbers to provide a quality sports fishery and supply brood stock (1,000 adults) to the Hells Canyon Trap for collection of spawn for the next production cycle.

IDAHO FISH AND GAME GOALS

1. Provide quality steelhead smolts to the Snake and Salmon rivers that will survive the downstream migration and return as adults in sufficient numbers to provide a quality sports fisheries in these rivers and their tributaries.

2. Provide quality hatchery steelhead for supplementation where the wild stocks of steelhead have diminished below desired levels and where managers feel a quality hatchery steelhead would enhance the fisheries resource.

3. Enhance the genetic quality of hatchery stocks through management and hatchery practices that favor genetic variability and the wild genetic component.

FACILITY DESCRIPTION

Incubation and Early Rearing

Spring water supplies 20 up-welling incubators and 20 six-foot wide circular vats for hatching and early rearing. These incubators provide space for hatching and early rearing for up to 1.2 million steelhead eggs. The early rearing vats provide a total of 1,130 cubic feet, providing enough rearing space for 1.2 million fry for up to 30 days.

Production

Spring water is delivered to 14, 300 ft x 10 ft x 3 ft raceways from May through early April. Excluding the 50-ft quiescent zones for waste settling, these raceways furnish 87,500 cubic feet of rearing area. This allows for a total production of 250,000 pounds of 8-inch steelhead smolts without exceeding the recommended .35 density index. Niagara Springs water is also available for domestic use, irrigation of 10 acres of lawn, and for fire hydrants.

Buildings on the hatchery grounds include:

1. Four residences (three wood frame houses and a mobile home).

2. One metal building (32 ft x 80 ft) containing an office, two incubator rooms, a workshop, and garage.

3. A small storage building (10 ft x 30 ft).

4. A metal building (20 ft x 10 ft) which stores a 20-ton chiller unit .

WATER SUPPLY

Niagara Springs supplies water to Idaho Fish and Game's Niagara Springs Wildlife Management Area, Rim View Trout Company, Idaho State's Pugmire Park, and Idaho Power Company's Niagara Springs Steelhead Hatchery. The historic 280 cubic feet per second (cfs) of water is divided based on several water rights. Niagara Springs Steelhead Hatchery has a water right for 132 cfs. Water is a constant 58°F, and gravity flows to the hatchery for raceways, incubators/early rearing vats, domestic use, and irrigation.

Increased demand on the aquifer by agricultural and domestic uses has caused a decline in both quantity and quality of water in the spring. As ground water demands have expanded and the drought conditions have continued, the springs have declined by 10% to 20% of historic conditions. Laboratory analysis by Health and Welfare of domestic water (after chlorination) showed the presence of fecal coliform bacterium. This prompted additional work on the chlorinator and modifications to the operation of this unit.

STAFFING

The Idaho Fish and Game Department staffs the hatchery with four permanent employees and three temporaries. Hatchery management is handled by a Hatchery Superintendent III (Jerry Mowery) assisted by a Hatchery Superintendent I (Gary Bertellotti). There are two Fish Culturists (Roger Elmore & CalLee Davenport) present for operations of the facility. During periods of peak work loads, there are three temporary employees (two Bio-aides and one Laborer) that assist the permanent staff with culture, maintenance, and other needed assignments.

FISH PRODUCTION

Eaa Shipments and Early Rearinq

Niagara Springs Hatchery received eyed eggs from Oxbow Hatchery, Pahsimeroi Hatchery, and Sawtooth Hatchery. There were 1,013,846 Snake River stock eyed eggs shipped between March 30 and April 14, 1992 from Oxbow Hatchery. Pahsimeroi Hatchery shipped 402,592 Salmon River stock eyed eggs to Niagara Springs between April 28 and May 5, 1992. Green eggs were taken at Pahsimeroi Hatchery, eyed up at Sawtooth Hatchery, and then shipped to Niagara Springs Hatchery as eyed eggs (729,359) from May 7 to 22, 1993. Total eyed eggs received at Niagara Springs was 2,145,797.

All eggs were treated with an iodophor solution (1:100 Argentyne) for disease control. Eggs were enumerated using the displacement method, then 50,000 to 136,000 eggs were placed in each up-welling incubator. Flow through each incubator was 10 to 40 gallons per minute. Egg stocks were isolated to prevent disease transfer and to maintain stock separation.

With only 20 six-foot circular vats for early fry rearing, sac fry and swim-up fry were at a density index which exceeded optimum conditions. Beginning density indexes ranged from .35 (pounds of fish per cubic feet of rearing space)

to 1.17. The hatchery experienced mortality in these vats of 13.5% due to overcrowding and oxygen depletion.

Due to the lack of available vat space and high densities, fry had to be transferred to outside nursery areas before reaching an optimum (400-600/lb) size. Detrimental conditions were magnified as fry were transferred to outside raceways at a smaller size (1,000-1,500/lb). Difficulty in feeding, poor conversions, stress caused by exposure to direct sunlight, and escapement were all conditions that contributed to additional losses.

Final Production Rearing

To fulfill mitigation goals with the current Environmental Protection Agency (EPA) discharge criteria and to maintain smolt quality, 80,000 Hells Canyon fry (44 lbs, 18,18/lb) were shipped to Lynn Babbington on April 29, 1992. Babbington received 293,000 adipose fin-clipped fingerlings (12,470 lbs, 23.5/lb) on October 27, 1992. These fish were reared for release below Hells Canyon Dam.

Three raceways of Salmon River stock were reared under various density conditions as part of a three-year study to determine if densities affect fish quality, outmigration survival of smolts, and returns to the trap as adults. In October, three raceways were stocked with adipose fin-clipped fingerlings. There were 81,800 stocked in raceway 2, 80,000 stocked in raceway 6, and 81,000 stocked in raceway 7. Raceway volumes were set at 3,750 cubic feet (150 ft x 10 ft x 2.5 ft, 150-ft quiescent zone), and final rearing density indexes exceeded .55. As a comparison, raceway 1 (80,000), raceway 5 (81,000), and raceway 8 (80,000) were reared at lower (normal) densities of 6,250 cubic feet (250 ft x 10 ft x 2.5 ft, 50-ft quiescent zone) of available rearing space. Ending rearing densities were from .33 to .37. To monitor this study, fish were tagged with Passive Integrated Transponder (PIT) tags and left ventral (LV) fin-clipped.

All other raceways with Salmon River stock (3,4,9,10,11) were set at 6,250 cubic feet and were stocked with approximately 80,000 fingerlings each (raceway 11 had 67,000). Ending rearing densities for those raceways were .32 to .36.

Snake River stock were placed in raceways 12 through 14, with rearing areas of 6,250 cubic feet with a 50-ft quiescent zone. Approximately 85,000 adipose fin-clipped fingerlings were placed in each raceway, and ending rearing densities were at .36.

Production assessment of fish was done by comparing feed conversions, mortality, and health parameters. Comparisons of high and low density rearing was done to find beneficial culture techniques that result in good fish health and effective fish production. Long-term objectives are to determine and identify fish culture guidelines that will yield steelhead smolts which return as adults in the most abundant numbers.

Overall feed conversion rate from May 1992 to April 1993 was 1.33. Fish were not dispersed to all raceways until early November, and feed conversions could not be determined for the density study groups until the end of November. Overall feed conversion rate for high density rearing (raceways 2,6,7) was 1.34 and was 1.33 for the low density groups (raceways 1,5,8) (Table 1).

Table 1. Feed conversion for density study groups.

Density:	Low (<.35) Raceway #			High (>.50) Raceway #		
Month	1	5	8	2	6	7
NOV	1.12	0.90	1.02	2.37	0.94	1.33
DEC	1.62	1.44	1.27	1.24	1.34	0.99
JAN	1.32	1.51	1.45	1.14	1.56	1.47
FEB	2.05	1.55	1.59	2.27	1.14	1.56
MAR	1.72	1.31	1.42	1.35	1.79	1.18
APR	1.93	0.71	1.22	1.35	1.63	1.22
AVE	1.63	1.24	1.33	1.62	1.40	1.11

Production mortality was .0234% daily (95.79% survival) in the high density groups and .0086% daily (98.45% survival) in the low density group during the study. Mortality was increased in one of the high density groups (raceway 6, 6,000 fish) when a fresh flow aerator failed to work in one compartment of a fish tanker. Normal mortality would have been .0113% daily (98.31% survival) if this incident would not have happened. The Hells Canyon group survived at 98.52% from November until April releases.

Length-frequencies were taken prior to release on all raceways (Table 2). Pahsimeroi stock were released at Pahsimeroi Hatchery's weir from April 19 to April 24, 1993. Hells Canyon stock and 84,000 Pahsimeroi stock were released below Hells Canyon Dam from April 24 to April 27, 1993. Releases to the Pahsimeroi River (Salmon River stock) totalled 761,800 (162,825 lbs @ 4.68/lb). Releases below Hells Canyon Dam in the Snake River (Snake and Salmon river stock) totalled 353,600 (72,250 lbs @ 4.89/lb).

FISH HEALTH

Fish health is always a concern at Niagara Springs Hatchery. The location of Niagara Springs, in the heart of the commercial trout industry, makes it vulnerable to horizontal transmission of many etiologic agents. Disease problems from many of these agents, infectious pancreatic necrosis virus (IPNV), infectious hematopoietic necrosis virus (IHNV), bacterial furunculosis (Aeromonas salmonicida), and bacterial cold water disease (Flexibacter psvchrophilus), have caused significant losses in years past. Reduction of steelhead numbers reared at Niagara Springs from past production years has produced a better quality smolt and less disease problems. Additionally, the hatchery and spring (water source) are located directly below agricultural land, exposing both to toxic drift and runoff from chemical application to fields above the hatchery.

Organosomatic Index indicators showed Lynn Babington's fish to meet size requirements for release and to be in a healthy condition. The gills were marginated, frayed, and eroded in some fish. Overall, there was an improvement in Mr. Babington's production efforts as compared to the previous year.

Table 2. Length frequencies at release, brood year 1992-1993.

	Raceway													
		2	3	4	5	6	7	8	9	10	11	12	13	14
Sample size	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Average, mm	207.6	211.9	206.1	201.7	213.2	211.4	208.1	208.2	205.3	216.9	216.7	204.8	210.1	201.9
Lower range, mm	172	148	176	162	184	184	180	174	172	178	152	176	166	148
Median, mm	202	217	204	204	215	211	209	208	209	212	214	204	208	206
Upper range, mm	260	250	236	238	238	248	254	248	254	270	298	242	258	252

Pahsimeroi average length (mm) - 209.7 -- 8.257 inches
Hells Canyon average length (mm) - 205.6 -- 8.094 inches
Overall average length (mm) - 208.9 -- 8.222 inches

Pahsimeroir range (mm) - 148-298
Hells Canyon range (mm) - 148-258

Virus (IHNV and IPNV) is an ever present concern at Niagara Springs Hatchery. Stringent sanitation programs are implemented to facilitate disease control. Horizontal transmission control measures in the form of bird netting installation over the raceways, as well as other alternatives, are being considered.

During the early part of this brood year (June/July), Hells Canyon stock became infected with cold water disease. Fish were fed a 21-day treatment of medicated feed with Oxytetracycline (TM-100, 4,000 g/ton), and mortality was nearly eliminated. These fish were then prone to secondary infections, and an outbreak of IHNV began in July and existed through late October. It is believed that the IHNV was introduced to the raceways by bird contact. The virus was isolated initially in a few raceways, but spread throughout all the raceways by horizontal (bird) transmission. During peak outbreaks of IHNV, fish were taken off feed to reduce stress until mortalities diminished. There was an 11.1% mortality rate experienced in this outbreak.

Adipose fin-clipping began in mid-October and proceeded through early November just after peak illness. Soon after ad-clipping, the fish encountered a small outbreak of cold water disease and were fed medicated feed (TM-100, 4,000 g/ton) for 14 days.

Late in the production cycle (March), bacterial furunculosis was diagnosed in most of the raceways, and medicated feed was fed at a rate of 50 mg sulfadimethozine (Romet-30) for every 1 kg of fish per day. A five-day treatment proved to be effective. A 42-day withdrawal period was completed before the fish were released.

To compensate for high mortality (diseases) at Niagara Springs, excess fish were shipped from Hagerman National Fish Hatchery to Lynn Babbington on September 3, 1993 and November 23, 1993. These fish were used to assist Niagara Springs Hatchery in meeting its mitigation goals.

FISH MARKING

Fin Clipping

All hatchery-reared steelhead in the state are marked with an adipose fin clip. Adipose clipping is done so that sportsmen can differentiate hatchery and wild steelhead. The clipping process also gives the hatchery staff an accurate inventory of fish on the station. Steelhead at Niagara Springs Hatchery were ad-clipped between October 13 and November 3, 1992, which was later than usual because the fish were not at a clippable size (60/lb or larger). Diminished growth was due to IHNV and cold water disease.

Coded Wire Taws and PIT Tags

Brood year 1992 steelhead were coded wire-tagged (CWT) from November 30 through December 10, 1992. A total of 186,122 fish were CWT and left ventral fin-clipped at the average size of 13.24/lb.

Information gained from the CWT fish released at Pahsimeroi will be used to quantify the differences in adult returns of steelhead reared at Niagara Springs Hatchery. High density reared fish received code numbers 10/44/11 (raceway 2), 10/44/24 (raceway 6), and 10/44/25 (raceway 7). These fish averaged 13.14/lb and numbered 62,701 fish. Lower density reared fish received codes

10/44/10 (raceway 1), 10/43/12 (raceway 5), and 10/44/26 (raceway 8). These fish (63,218) averaged 12.56/lb (Table 3).

Raceways 1, 2, 5, 6, 7, and 8 (Salmon River stock) each contained 100 Passive Integrated Transponder (PIT) tagged smolts numbered DAC93055.N01 through DAC93055.N08. Raceways 12-14 (Snake River stock) each contained 100 PIT-tagged smolts with code numbers DAC93055.N12 through DAC93055.N14 (Table 4). All PIT-tagged fish were left ventral clipped.

Coded wire tag retention was checked on February 24, 1993. Pahsimeroi stock had a 95.22% retention (857 out of 900 checked), and Hells Canyon stock had a 93.11% retention (419 out of 450 checked). A total of 125,919 Pahsimeroi stock fish received CWT. With a mortality of 1,758 CWT fish, and a 95.22% tag retention, approximately 118,224 CWT fish were released April 19-24, 1993. In the Hells Canyon stock, 60,203 fish received CWT. With mortality of 272 CWT fish and a 93.11% retention, approximately 55,783 CWT fish were released April 24-27, 1993.

Left ventral fin-clipped mortalities were scanned after PIT tagging, and 3 PIT-tagged fish were found (7F7D24135A, 7F7D407545, and 7F7D2F4434). Assuming 100% PIT tag retention, 897 PIT-tagged fish were released April 19-27, 1993. A total of 598 PIT-tagged fish were released in the Pahsimeroi River and 299 in the Snake River at Hells Canyon (Table 4).

RECOMMENDATIONS

Completed Improvements

Hatchery Safety

The headrace, tailrace, and bridge have been covered with grating by IPC to prevent any accidents or serious injury to public and staff. These were listed in the IPC 1991 safety inspection manual as possible safety concerns for visitors and staff.

A new Delta table saw was purchased to replace the old table saw. This new saw provides a higher quality cut and is much safer and sturdier than the old saw.

Building Maintenance and Hatchery Improvement

Siding, gutters, and new windows were installed on the three residences and greatly improved the overall appearance. Landscaping around the residences is in progress and will be completed soon. New kitchen and bathroom sinks and associated plumbing were installed to replace old sinks that were cracking. Seams in the ceilings were plastered, and ceilings were repainted.

Fish Pro and CH2M Hill drafted plans for hatchery improvements. Paul Abbott (IPC), Tom Rogers (IDFG), and the hatchery staff met at various times to review designs and offer their input. Final plans were completed, and bids are set to go out for construction in the near future.

Table 3. Brood year 1992 tag summary for steelhead at Niagara Springs Hatchery.

CWT #	Number tagged	Mortality to release	Total tags	% tag retention	Tagged fish released	Release site	Experimental group
10-44-10	20,605	196	20,409	96.66%	19,727	Pah below weir	Low density
10-44-12	21,514	75	21,439	97.33%	20,867	Pah below weir	Low density
10-44-26	21 099	131	20.968	93.33%	19.569	Pah below weir	Low density
TOTALS	63,218	402	62,816		60,163		
10-44-11	20,359	132	20,227	96.00%	19,418	Pah below weir	High density
10-44-24	21,501	1,140	20,361	96.00%	19,547	Pah below weir	High density
10-44-25	20.841	84	20.757	92.00%	19.069	Pah below weir	High density
TOTALS	62,701	1,356	61,345		58,061		
10-44-27	20,594	54	20,540	94.00%	19.308	Hells Canyon	Control
10-44-28	18,927	65	18,862	93.33%	17,604	Hells Canyon	Control
10-44-29	20.682	272	59.931		55.798		
TOTALS	60,203	272	59,931		55,798		
TOTAL CWT RELEASES	186,122	2,030	184,092	94.53%	174,022		

Table 4. Brood year 1992 PIT tag summary for steelhead at Niagara Springs Hatchery.

CWT N	Number tagged	Mortality to release	Total tags	% tag retention	Tagged fish released	Release site	Experimental group
DAC93055.N01	100	2	98	100.00%	98	Pah below weir	Low density
DAC93055.N05	100	0	100	100.00%	100	Pah below weir	Low density
DAC93055.N08	100	0	100	100.00%	100	Pah below weir	Low density
TOTALS	300	2	298		298		
DAC93055.N02	100	0	100	100.00%	100	Pah below weir	High density
DAC93055.N06	100	0	100	100.00%	100	Pah below weir	High density
DAC93055.N07	100	0	100	100.00%	100	Pah below weir	High density
TOTALS	300	0	300		300		
DAC93055.N12	100	0	100	100.00%	100	Hells Canyon	Control
DAC93055.N13	100	0	100	100.00%	100	Hells Canyon	Control
DAC93055.N14	100	1	99	100.00%	99	Hells Canyon	Control
TOTALS	300	1	299		299		
TOTAL PIT TAG RELEASES	900	3	897	100.00%	897		

New Office Equipment

A new computer was purchased by IPC for hatchery use to replace the older, slower model. The new computer was equipped with a DOS Shell and various software upgrades. A dedicated phone line was installed for computer modem use to call in time and communicate with other systems. IPC also provided a new computer workstation to place the computer on.

A copy machine was leased from Xerox for the year. The copier has improved overall office efficiency and eliminated the need to go elsewhere for copies.

Other Improvements

An electric winch was purchased and a hoist system was built by the Malad Gorge IPC shop and will be used for fish pumping and other jobs on the bridge. An A-frame is being built by the IPC shop for use with the winch in the shop area.

Various maintenance items (valve repair, bridge maintenance, power line work, etc.) were addressed during the year by crews from the IPC shop and were greatly appreciated.

Needed Improvements

Early Rearing and Incubation

The upwelling incubators and circular vats are not adequately designed to safely hatch and rear fry that are required for the station's mitigation. Suffocation occurs when fish are allowed to swim out of incubators and subsequently pile up on the bottom of vats.

An expansion of the present nursery facility to twice the present size would adequately accommodate early rearing systems. In this expansion, the 20 round, early rearing tanks would be replaced with 40 early rearing raceways. This would provide at least three times the rearing volume, based on optimum density indices, and the growout time needed to get the fish to a larger size before moving them to outside raceways. This system would protect smaller fry from bird predation and provide them shade from the sun.

The current incubation water intake is shared with the irrigation and domestic systems. When the irrigation lines are activated, air is taken into the system causing "bubbling" in the incubators. Air is then trapped beneath the eggs and causes suffocation. Anew line that is separate from the irrigation and domestic lines needs to be built to accommodate the nursery facilities, and its water collection point from the springs needs to be lower in the spring to assure a continuous supply of water.

A new drain system needs to be installed in this expansion to adequately drain the water used. This drain system should be four times the current drain's capacity.

Final Rearing

At present production, raceways provide adequate rearing space for 250,000 pounds of smolts (density index of .35). To meet FERC requirements, Niagara Springs Hatchery needs an additional 69,000 cubic feet of rearing space (density index at .30). Associated equipment for waste removal, feeding, screens, and all necessities would be included.

Presently, steelhead are exposed to fish-eating birds. These birds carry disease-producing pathogens which have caused dramatic fish losses in the past. Direct losses from bird depredation can be as high as 10%. Depredation losses, as well as losses attributed to bird-transmitted diseases, can be substantially reduced with the installation of bird netting over the raceways.

With the use of bulk feed, it is important to deliver a high quality product with minimal fines. Rangen's has a high quality feed, but when delivered in bulk, it has 8 to 15% fines. Fish do not utilize these fines and, therefore, it goes to waste. Rangen's Feed Company will pick up and refund the cost for fines if they are collected and stored. Installation of a fines separator for each bulk bin will cut down that waste and our feed cost. The cost of these separators would be offset by the feed cost savings and feed conversion rates over a two- to three-year period.

Present wood-framed screens are porous and have a potential to harbor pathogenic organisms, deteriorate quickly, and require constant maintenance. Aluminum screens and frames are light weight, corrosion resistant, easy to handle, and have an impermeable surface. The long life and low maintenance of aluminum screens would be a substantial cost savings compared to the present wood-framed screens.

Transport of 232,000 pounds of smolts required 23 days (using 2 IPC tankers, 1991), and may exceed twice that when production reaches 400,000 pounds. This may not coincide with spring run-off high flows and basin-wide releases. Using 5-6 tankers (2 IPC tankers and 3-4 contract tankers) per day, fish transport took 9 days in 1992. It is recommended that IPC supply at least two more transport tractors and trailers to adequately get the fish out in a shorter amount of time.

Fish Waste Treatment System

Due to fish waste production throughout the year, the settling system is incapable of meeting EPA criteria for waste discharge. Existing pipelines from the raceways to the settling pond are undersized and incapable of handling the waste water flow from one raceway. This system needs to be enlarged by three times its present capacity to operate within EPA limits during smolt production. The present valves that control water to the settling pond require replacement. These valves have become extremely difficult to operate and now pose a threat to employee safety.

Cleanways on each side of the raceways trap sand, spilled feed, debris from the head box, fish waste from the incubation rooms, and other materials which are allowed to wash into Niagara Springs Creek. Modifications to both cleanways should include a delivery system that allows these materials to be directed to the settling pond.

Employee Safety

Raceway walls are eight inches wide and used as walkways to clean screens, raceway sides and bottoms, and quiescent zones. Walking these walls is a safety problem all year round and becomes extremely dangerous in the winter. Non-skid walkways need to be installed the full length of the raceway wall to eliminate this hazard.

The step onto or down from the bridge from/to a raceway wall is of great concern. Since this is a commonly used path for employees, a step should be attached to the bridge to decrease the height of the step up or down.

When taking water samples (EPA) from the raceway effluent, there is a need to stand on the stream bank retaining rocks that are slick and potentially dangerous. This could be eliminated by the installation of a flat concrete retaining barrier. This would provide a stable surface to stand on and samples could be taken without fear of falling in.

Hatchery Residences

Several major improvements are necessary to maintain the current residences at Niagara Springs Hatchery. These houses are approximately 28 years old and are in need of new carpeting, linoleum, and counter tops. There is a need for television station reception. The installation of satellite dishes and receivers would improve this.

With the degradation of the spring water, domestic water must be treated by chlorination before use. Coliform bacteria, fecal coliform bacteria, and above standard amounts of nitrates/nitrites have been found in the drinking water. The installation of an underground domestic well would eliminate water being drawn from an open air source (airborne contaminants).

New underground timer-controlled irrigation systems should be installed to replace old system. This would give the lawns adequate watering even at times when hatchery staff are not available.

There is also the need for one more wood frame house that would replace the old trailer. There are four full-time employees at this station and adequate housing for only three.

Building Improvements

Buildings for storage, work areas, office, incubation, and early rearing are inadequate for the effective operations of Niagara Springs Hatchery. Storage of equipment has been in the work areas of the garage and shop. This has created a safety hazard in those work areas and has eliminated much of the area needed for maintenance and repairs. A separate storage facility, garage, and work area is needed if the hatchery is to provide a safe and productive work environment for its employees.

Incubation and early rearing are one-third the size needed to produce and maintain eggs and fry sufficient for the mitigation requirements. The operation of the incubation room during peak production of fry and eggs precipitate direct fry and egg mortality. This is 80% of the total mortality throughout the rearing cycle and could be a preventable loss. Incubation rooms and rearing space need to be at least tripled.

Office space and public restrooms need to be expanded. There is no break room for employees to eat lunch or take a break. A new crew's quarters should be built to house temporary employees. There is no area where an individual can work in a quiet environment due to traffic in and out of the existing small office. With the addition of office partitioning, new lighting, window blinds, and carpeting, the general work area and office ambience would be improved. The purchase of a copy machine and FAX machine would greatly expedite information when and where it would be needed.

Public restrooms do not meet handicap access requirements. These restrooms are located next to the office, and traffic in and around the office becomes heavy and distractive to workers in the office. The heavy use is such that the septic system exceeds the capacity of the system and has plugged the drain field in the past. A new system is needed to accommodate the increased use that the Niagara Springs area has experienced in the past few years. As public use becomes greater, domestic water for the public and hatchery staff needs to be upgraded.

The park area across the creek needs to be upgraded with public restrooms, parking areas, and larger garbage facilities. There also needs to be more protection for the hatchery's water intake and head pool from trash and swimmers.

Budget Enhancement

A budget enhancement will be necessary for additional personnel needs and equipment requirements to accommodate the operation of Niagara Springs Hatchery as the reconstructed facility comes on line with additional raceways. An increase of raceway cleaning time, cleaning waste pond maintenance, and vacuum systems will require enhancement.

APPENDIX

Appendix A. Niagara Springs production history for brood years 1966 to 1992.

Year	Pahsimeroi eggs/fry received	Oxbow eggs/fry received	Total eggs/fry received	Total yearly mortality	Percent mortality yearly	Fall releases
1965-66	0	3,085,194	3,085,194	---	---	0
1966-67	0	2,605,288	2,605,288	623,533	23.93	29.400
1967-68	0	3,215,652	3,215,652	1,209,183	37.60	0
1968-69	0	2,469,536	2,469,536	695,219	28.15	0
1969-70	1,477,695	1,927,727	3,405,422	654,022	19.21	757,500
1970-71	1,330,494	1,480,150	2,810,644	(305,176)	-10.86	670,960
1971-72	1,439,842	700,061	2,139,903	153,603	7.18	215,625
1972-73	8,850,764	1,819,721	10,670,485	3,105,637	29.10	3,008,664
1973-74	3,663,990	1,264,384	4,928,374	2,953,847	59.94	0
1974-75	3,160,144	280,098	3,440,242	2,108,426	61.29	0
1975-76	2,234,978	51,559	2,286,537	513,688	22.47	40,977
1976-77	2,487,824	730,862	3,218,686	1,642,383	51.03	0
1977-78	2,540,728	517,250	3,057,978	1,229,537	40.21	281,208
1978-79	2,048,350	441,069	2,489,419	426,977	17.15	344,944
1979-80	2,622,425	124,814	2,747,239	203,985	7.43	548,987
1980-81	1,697,010	498,416	2,195,426	720,172	32.80	0
1981-82	2,003,418	298,952	2,302,370	953,015	41.39	0
1982-83	2,313,339	253,776	2,567,115	1,431,975	55.78	500,000
1983-84	2,749,292	709,716	3,459,008	1,849,313	53.46	449,070
1984-85	2,333,760	598,404	2,932,164	613,771	20.93	630,500
1985-86	1,332,152	1,582,340	2,914,492	903,999	31.02	330,640
1986-87	1,339,176	935,195	2,274,371	422,476	18.58	39,995
1987-88	1,640,040	1,289,029	2,929,069	775,569	26.48	404,000
1988-89	1,256,289	1,213,399	2,469,688	803,488	32.53	0
1989-90	1,925,795	833,397	2,759,192	252,892	9.17	603,000
1990-91	1,966,434	113,190	2,079,624	311,624	14.98	0
1991-92	650,400	691,500	1,341,900	311,400	23.21	0
1991-92	WALLOWA	812,000	812,000	394,936	48.64	0
1992-93	1,131,951	1,013,846	2,145,797	1,030397	48.02	0
1992-93	402,383	372,904	775,287	198,731	25.63	0
1992-93	RELEASE TO BROWNLEE RESERVOIR-SPRING 1993					

Appendix A. Continued.

Year	Salmon R. smolt releases	Hells C. smolt releases	Spring releases	Total lbs released	Feed fed total lbs	Total feed cost	Conversion	Cost/lb	Fish/lb
1965-66	---	---	---	---	---	---	---	---	
1966-67	1,364,842	587,513	1,952,355	153,552	305,890	$15,060.70	1.99	$0.0492	12.71
1967-68	1,664,325	342,144	2,006,469	204,251	298,450	$24,844.27	1.46	$0.0832	9.82
1968-69	1,665,117	109,200	1,774,317	184,186	280,430	$22,137.12	1.52	$0.0789	9.63
1969-70	1,608,000	385,900	1,993,900	299,235	502,410	$40,287.01	1.68	$0.0802	6.66
1970-71	1,630,002	0	2,444,860	202,025	384,040	$35,329.34	1.90	$0.0920	12.10
1971-72	1,555,050	0	1,770,675	235,375	376,080	$36,365.14	1.60	$0.0967	7.52
1972-73	1,543,349	0	4,556,184	163,839	266,800	$34,107.06	1.63	$0.1278	27.81
1973-74	1,960,378	0	1,974,527	187,494	319,130	$62,936.25	1.70	$0.1972	10.53
1974-75	1,331,280	0	1,331,816	166,640	352,890	$58,298.81	2.12	$0.1652	7.99
1975-76	1,690,390	0	1,731,872	248,708	437,600	$65,441.18	1.76	$0.1495	6.96
1976-77	1,433,675	141,005	1,576,303	251,835	454,762	$88,410.40	1.81	$0.1944	6.26
1977-78	1,266,025	0	1,547,233	154,829	370,080	$64,886.70	2.39	$0.1753	9.99
1978-79	1,372,454	0	1,717,498	244,887	643,680	$110,914.96	2.63	$0.1723	7.01
1979-80	1,097,060	348,220	1,994,267	314,100	629,580	$122,013.28	2.00	$0.1938	6.35
1980-81	862,494	612,760	1,475,254	316,330	622,930	$136,520.33	1.97	$0.2192	4.66
1981-82	995,205	354,150	1,349,355	374,350	663,850	$141,396.46	1.77	$0.2130	3.60
1982-83	542,390	92,750	635,140	181,150	448,860	$95,562.29	2.48	$0.2129	3.51
1983-84	752,195	408,430	1,160,625	310,000	632,400	$153,516.74	2.04	$0.2428	3.74
1984-85	1,273,181	414,712	1,687,893	314,650	541,198	$159,545.17	1.72	$0.2948	5.36
1985-86	860,358	819,495	1,679,853	339,885	580,850	$141,076.94	1.71	$0.2429	4.94
1986-87	1,011,900	800,000	1,811,900	419,000	557,960	$129,627.61	1.33	$0.2323	4.32
1987-88	872,100	877,400	1,749,500	405,515	584,290	$146,758.80	1.44	$0.2512	4.31
1988-89	930,700	735,500	1,666,200	406,800	574,770	$174,261.24	1.41	$0.3032	4.10
1989-90	956,100	947,200	1,903,300	465,400	597,310	$177,142.13	1.25	$0.2966	4.09
1990-91	856,000	912,000	1,768,000	484,025	632,030	$189,429.54	1.28	$0.2997	3.65
1991-92	786,600	243,900	1,030,500	232,500	283,000	$ 81,144.45	1.22	$0.2867	4.43
1991-92	0	417,064	417,064	72,786	?	?	?	?	5.73
1992-93	761,800	353,600	1,115,400	235,075	331,666	$106,115,35	1.41	$0.3199	4.74
1992-93	222,560	306,907	529,467	119,500	?	?	?	?	4.43
1992-93	0	0	47,089	11,590	?	?	?	?	4.06

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